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Developmental Test and Evaluation Role in Assessing System Reliability

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In April 2007, the Under Secretary of Defense for Acquisition, Technology, and Logistics [USD (AT&L)] requested the Chairman of the Defense Science Board (DSB) to establish a task force on developmental testing. A subject of concern was that although several initiatives had been implemented within the Department to stress better system engineering practices, recent history shows that poor performance during initial operational test and evaluation (IOT&E) "suggests deficiencies in developmental test & evaluation (DT&E) processes." One specific problem identified was the lack of focus on reliability, availability, and maintainability (RAM) during system design. The Under Secretary requested the DSB address this problem and develop recommendations to improve the Department's DT&E processes. The goal is to identify suitability problems early enough to change the system design while in development versus retrofitting it after it has performed poorly in IOT&E.

The Defense Science Board (DSB) Task Force finished their study in early 2008. The DSB's findings concluded that systemic changes to acquisition processes and a lack of a disciplined systems engineering process have resulted in the high failure rates in suitability. In February 2008, the Deputy Under Secretary of Defense (Acquisition and Technology) and the Director, Operational Test and Evaluation (DOT&E) established the Reliability Improvement Working Group to implement three specific recommendations of the DSB: (a) ensure programs are structured with a viable systems engineering strategy to include a reliability, availability, and maintainability (RAM) growth program as an integral part of design and development, (b) reconstitute a cadre of personnel within the Department and the Services with training and experience in test and evaluation (T&E) and RAM, and (c) implement the Office of the Secretary of Defense (OSD) policy to integrate developmental and operational testing.

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In July 2008, the RIWG recommended, and the USD (AT&L) issued, a new RAM policy to ensure RAM requirements are incorporated into development contracts and system designs, and evaluated in each phase of the acquisition life cycle (available at http://www.acq.osd.mil/sse/dte/docs/USD-ATLMemo-RAM-Policy-21Jul08.pdf). In addition to OSD policy, there are several initiatives within the Services to address RAM during the development phases of acquisition. In late 2007, the Army published a new policy mandating programs establish a reliability threshold before entrance into Milestone B. This new policy requires the threshold be incorporated into the system design and development (SDD) contract. Additionally, the system is expected to meet or exceed the threshold value for reliability by the conclusion of the first system-level test in SDD. The other Services are also assuring the proper policies are in place to focus on reliability during system development. Currently, both the Air Force and Navy require the system developer to address the requirements for reliability during system design as part of the SDD contract.

Another area addressed was the reduction in personnel with experience in T&E and RAM backgrounds. In the late 1990s, Congress directed several cuts to the military's acquisition workforce. These reductions, according to the DSB report, "put the DoD acquisition workforce on a precipitous path" to losing vital technical expertise, while at the same time, our weapon systems are becoming more complex. As one DSB member put it: "We went from Insight, to Oversight to Out of Sight."

The Services are reassessing their acquisition manpower allocations to ensure there is the proper focus on growing the experience levels of the T&E and RAM workforce. Additionally, the Defense Acquisition University has taken the initiative to examine their course curriculums to ensure our workforce is properly trained to employ sound T&E and RAM principles during system development.

The final focus area is the implementation of an integrated test policy within the Department. Integrated testing is the process of collaborative planning and execution of test phases and events to ensure the objectives of the stakeholders (both operational and developmental) are addressed. One of the primary purposes of T&E is to ensure that the system, as designed, will meet the warfighter's requirements in the operational environment. Operational Test and Evaluation (OT&E) evaluates the operational effectiveness and operational suitability of the design. By the time a system is ready for OT&E the design is pretty much fixed—it's too late to make major changes. One of the fundamental focuses of developmental test & evaluation (DT&E) is to test and evaluate *the system design* to ensure it will meet the warfighter's requirements. System developers and the DT&E community use the Joint Staff validated capability requirements documents as the source for system requirements. However, as is often the case, the Concepts of Operation (CONOPs) is not made available (or is not used) during SDD to help define the scope of developmental tests. Therefore, the system is not properly stressed during SDD when there is still time to make design changes. Integrated testing brings a "mission-oriented" approach during DT&E by getting all the team players involved in system development (contractor, program office, user, developmental test, and operational test) to incorporate the mission context into the developmental test strategy. That way, the system design can be tested based on how the system will be employed. Not taking the operational environment into account during development is akin to an automobile manufacturer building a half-ton pickup not knowing that the user needs a four-wheel drive truck. Both vehicles carry the required tonnage, but how it will be used (off-road) was not taken into account when the truck was on the drawing board. By using the CONOPs during the development of the statement of work, the system developer and manufacturer would have known the truck would be employed on rough terrain and would have incorporated a robust suspension system, four-wheel drive, etc. into the design. The vehicle would have then been tested in an off-road environment before being delivered to the customer. Although much more complicated, the same principle applies to weapon systems. Additionally, by infusing a mission-oriented approach during DT&E, data that is operationally representative can be used to reduce the scope of initial operational test and evaluation. Integrated Testing should not only save time and money in the test program, but the real savings will be in the dollars and time saved by less redesigns and retrofits after the system is in production. It's a "win-win" proposition. ❑